A Perceptual Study of the Rise-Fall Tone in English

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keywords: English, perception, Rise-Fall, High Fall

0. Introduction

The Rise-Fall tone, unlike major tones such as the Fall, has not been examined in depth in studies of English intonation, probably due to its low frequency[1]. I believe, however, that it is an important tone and needs to be analyzed thoroughly both in form and function. This is especially applicable to English spoken in the UK, including Welsh English, where the Rise-Fall is used extensively. Many British researchers classify this as a distinctive tone[2] (e.g. Sweet 1877, Palmer 1922, Armstrong and Ward 1926, Kingdon 1958, Schubiger 1958, Halliday 1967, Crystal 1969, O'Connor and Arnold 1973, Brazil et al. 1980, Cruttenden 1997 and Roach 2000). In this paper, the form of the Rise-Fall is examined from a perceptual point of view. There are two main purposes: (1) to examine perceptually important aspects of the Rise-Fall by changing its prosodic factors, especially the f0 contour, and (2) to compare this tone with the High Fall in order to learn how the three key prosodic factors rank among themselves in importance.

Thirteen female students of linguistics at the University of Reading participated in the perception tests for this research. The group consisted of ten British students, one American student, and two Greek students. All of them had normal hearing. The number of years spent studying English intonation in university ranged greatly: three-to-four months (10), two years (2) and 17 years (1). The tests were carried out in a regular classroom at the university, and a cassette tape player was used to play the audio data. All the test sheets used in the tests are shown in the Appendix.

Before the four main tests, a preliminary test was conducted to examine how well the participants could differentiate the Rise-Fall from the High Fall. This perceptual ability is indispensable for the following four tests. The result was that all of them had a keen ear for the identification of the Rise-Fall and so it was decided to treat all the data that were elicited from these 13 participants equally. There were two noteworthy

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[1] Crystal (1969) states that the frequency of occurrence of the Rise-Fall is 5.2% (cf. 51.2% for the Fall). Quirk et al. (1964) shows that it is 3.9% (cf. 52.5% for the Fall). Davy (1968) examines it from two types of speech data: 4.2% in conversation data and 2.1% in reading data (cf. 58.7% and 50.2%, respectively, for the Fall).

[2] Some researchers regard the Rise-Fall as an allotone of the High Fall (e.g. Gussenhoven 1984 and Couper-Kuhlen 1986).

features found in the results of this test. First, it seems that British English speakers do not necessarily have advantages over other speakers in recognizing the Rise-Fall. The three non-British English speakers responded better than some of the English speakers. Second, it appears much easier to differentiate the two tones when there is no tail. All the participants responded 100% correctly to this type of tone-unit.

1. Perception Test 1

The purpose of Perception Test 1 was to examine perceptual differences of the Rise-Fall in terms of different x-values of the peak. The utterance used in this test was a single vowel /ɑː/ so that no neighboring segments could influence perceptual quality in manipulation. As Figure 1 shows, the original f0 contour, which is indicated by the dotted line, can be simplified using four points (*Points 1*, *2*, *3* and *X*) and a straight line connecting them without hampering perceptional similarity. *Point 2* corresponds to the peak, and *Point X* makes the finality of the utterance clearer. The four points are located at (158 ms, 91.6 Hz) for *Point 1*, (280, 204.6) for *Point 2*, (423, 91.6) for *Point 3* and (592, 81.1) for *Point X*.

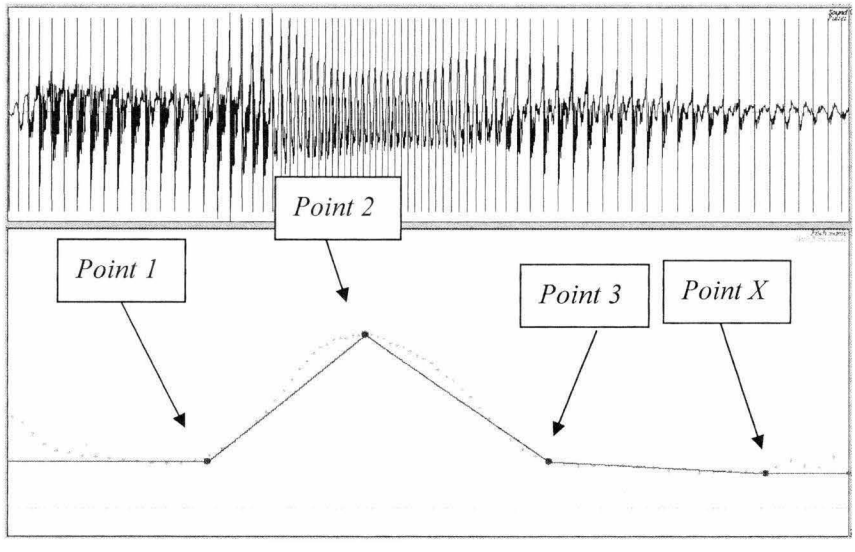

Figure 1 A simplified f0 contour

The utterances were modified in two ways. First, the x-value of *Point 2* was changed between *Point 1* and *Point 3* to make five different values: 180, 230, 280, 330 and 380 (ms). Each value is separated from its neighboring value with an equal difference of 50. The y-value was unchanged. The five utterances were named, from a smaller x-value, T1-1, T1-2, T1-3, T1-4 and T1-5. T1-3 matches the original data. Second, by connecting *Point 1*, *Point 2* and *Point 3*, *Triangle 123* was made to move along the x-axis, keeping its whole shape unchanged. *Point 3* was not plotted beyond

Point X. *Point 4* was made where *Line 13* and a perpendicular line from *Point 2* met. *Line 13* and *Line 14* show 265 and 122 (ms) respectively. Seven triangles were made and the x-value of their three points (*Points 1*, *2* and *3*) were (8, 130, 273), (58, 180, 323), (108, 230, 373), (158, 280, 423), (208, 330, 473), (258, 380, 523) and (308, 430, 573). The three points in each triangle are separated from those in neighboring triangles with an equal difference of 50. The seven utterances were named, from a smaller x-value, T2-1, T2-2, T2-3, T2-4, T2-5, T2-6 and T2-7. T2-4 matches the original data.

All 12 test items were grouped as a set, and two sets were made ('Set A' and 'Set B'). In the test sheet, Set A covers Nos. 1-12 and Set B, Nos. 13-24. In each set, the 12 items were arranged in random order. The participants' task was to judge whether each utterance was spoken with the Rise-Fall. There was a three-second pause after each item.

The test results are summarized in Figure 2.

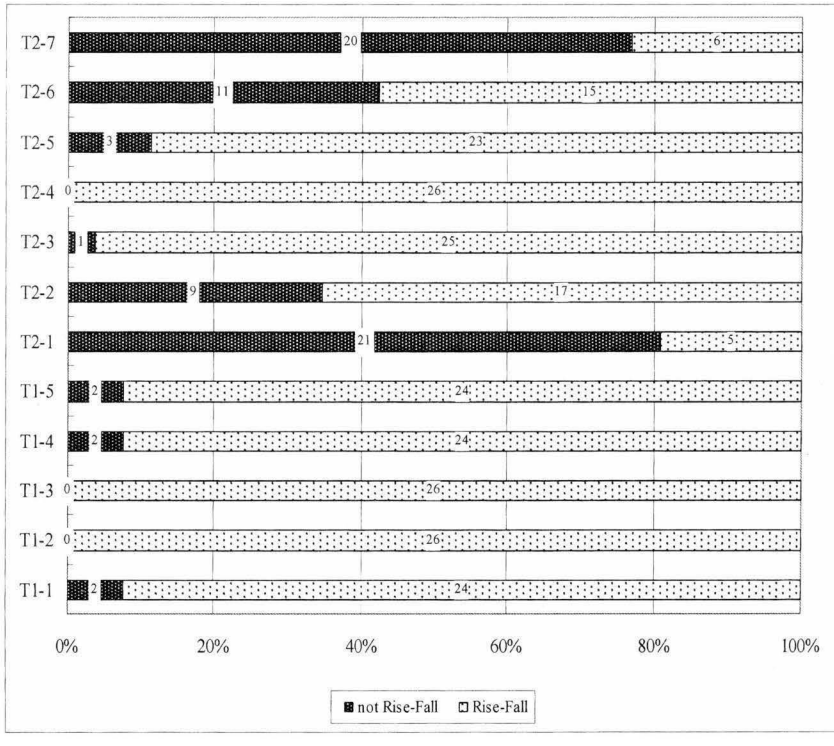

Figure 2 Results of Perception Test 2

The number in the bar indicates the number of responses. There were three main findings. First, all the participants perceived the four original utterances (T1-3 and T2-4) as the Rise-Fall. Second, no major perceptual difference was detected in the first type of modification. Only a small number of the participants did not perceive the

Rise-Fall: 2 (7.7%) in T1-1, 2 (7.7%) in T1-4 and 2 (7.7%) in T1-5. Third, a noticeable perceptual difference was detected in the second type of modification, because many participants did not perceive the Rise-Fall: 21 (80.8%) in T2-1, 9 (34.6%) in T2-2, 11 (42.3%) in T2-6 and 20 (80.8%) in T2-7.

2. Perception Test 2

The purpose of Perception Test 2 was to examine perceptual differences of the Rise-Fall in terms of different x-values of the peak (*Point 2*). Unlike Perception Test 1, the association between the peak and segments in the tonic syllable was taken into account in this test. The utterance used in this test was 'I ˈdon't ^blame you'.

Five utterances were created by changing the x-value of *Point 2* as well as those of *Points 1* and *3*, and they were named, from a smaller value, Type I, Type II, Type III, Type IV and Type V. The y-value was unchanged. Type IV corresponds to the original utterance. The association of the three points and the segments is summarized in Table 1.

	Point 1	*Point 2*	*Point 3*
Type I	1st element of /eɪ/	mid-/eɪ/	between /eɪ/ and /m/
Type II	1st element of /eɪ/	2nd element of /eɪ/	/m/
Type III	mid-/eɪ/	/m/	/j/
Type IV	between /eɪ/ and /m/	/j/	/u/
Type V	between /j/ and /u/	/u/	/u/

Table 1 The association of the three points and the segments in Types I-V.

Types II, III and IV are actually used among native speakers, but Types I and V are imaginary examples. Two hypotheses were created from this fact. First, Types I and V will not be perceived as the Rise-Fall. Second, there will be no perceptual differences among Types II, III and IV. Among the five types, the following 15 mathematically possible pairs were made: (1) I-I, (2) II-II, (3) III-III, (4) IV-IV, (5) V-V, (6) I-II, (7) I-III, (8) II-III, (9) I-IV, (10) II-IV, (11) III-IV, (12) I-V, (13) II-V, (14) III-V and (15) IV-V. In the test, all the pairs were included once and arranged in random order. The participants' task was to judge whether the two utterances were identical. On the test sheet, the utterance was written in the directions with the location and type of the tonic syllable. The high head symbol was deleted so as not to give extra information. There was one second between the two utterances in each pair, and there was a three-second pause after each item.

The test results are summarized in Figure 3.

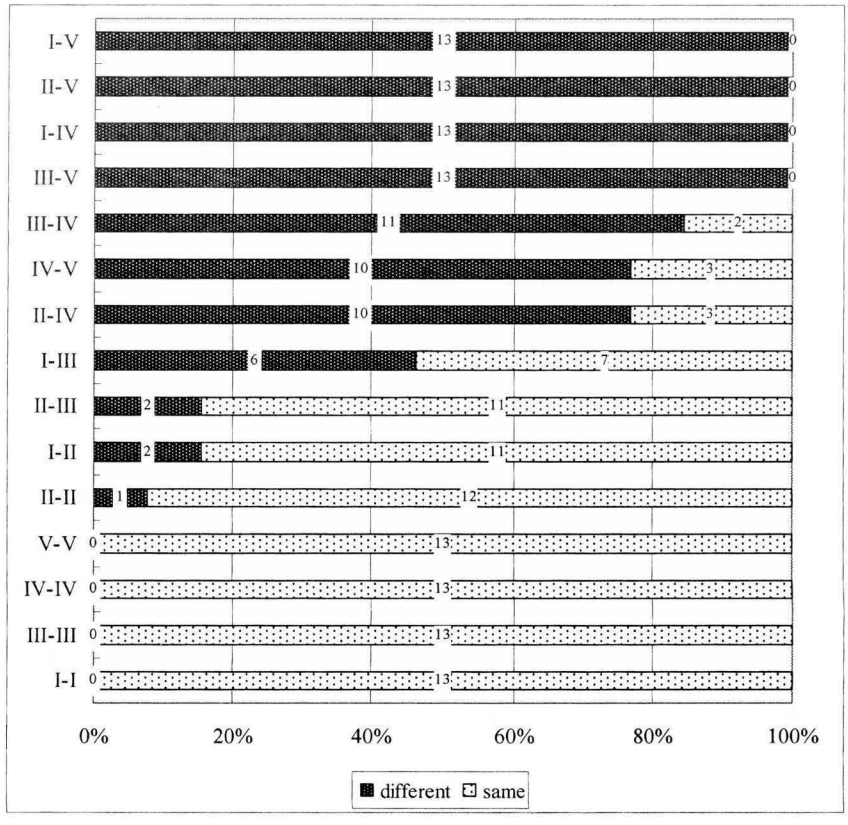

Figure 3 Results of Perception Test 2

This graph is arranged in descending order of the number of 'same' responses. The number in the bar indicates the number of responses. There were two main findings. First, the first hypothesis was partly supported. Type V was never perceived as the Rise-Fall, except when it was compared with Type IV. On the other hand, there was a great difference in perception of Type I. When it was compared with Type IV, no participant perceived any similarities, but when compared with Type II and Type III, more than half perceived similarities: 84.6% and 53.8%, respectively. Second, the second hypothesis was not supported. Many perceived differences in II-IV (76.9%) and III-IV (84.6%), but in the case of II-III, only 15.4% perceived differences.

3. Perception Test 3

The purpose of Perception Test 3 was to examine perceptual differences of the Rise-Fall in terms of different y-values of the peak (*Point 2*) from *Point 1*. In this test, the unit was converted to 'semitone' from 'Hz' to obtain normalized data so that they may be applicable to any speakers, irrespective of gender and age. The utterance used in this test was 'I've ˈjust won a ˈhundred ^pounds'.

Eight utterances were created with different y-values of *Point 2* from *Point 1*, which were differentiated equally by 2ST. The values are, from high to low, 10ST, 8ST, 6ST, 4ST, 2ST, 0ST, -2ST and -4ST.[3] The utterance with a difference of 10ST corresponds to the original utterance. No other changes were made in the other parts of the f0 contour.

In this test, each test item was read twice, the total number of the items being 16. The participants were presented the test items in random order, and their task was to judge whether there was a rise-fall movement in the tonic syllable. On the test sheet, the utterance was written in the directions with the location and type of the tonic syllable. The symbol for the high head was deleted because this was not relevant information in this test. There was a three-second pause after each item.

The results are summarized in Figure 4.

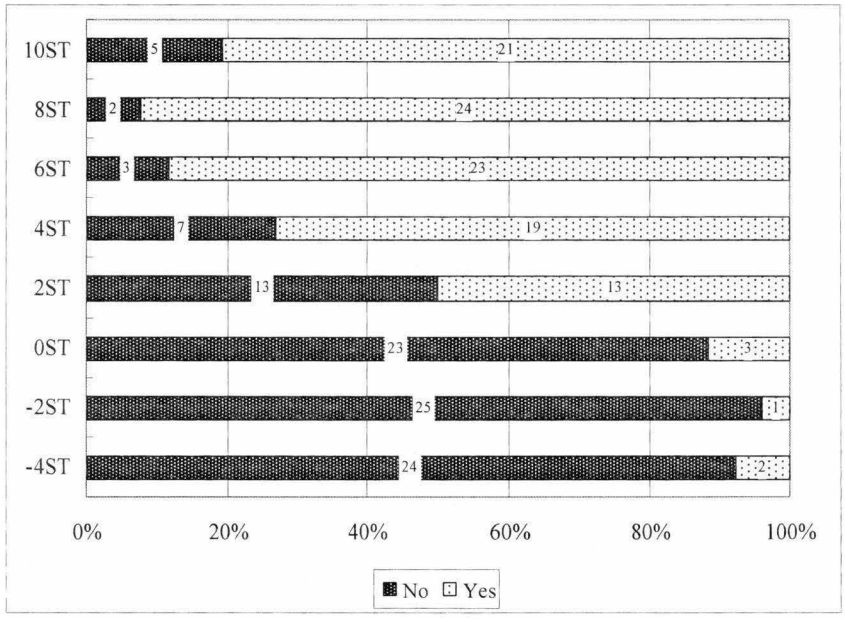

Figure 4 Results of Perception Test 3

The number in the bar indicates the number of responses. There were three main findings. First, the presence of the peak tended to be identified correctly. Most of the participants did not perceive a rise-fall movement in the utterances with a difference of 0ST, -2ST or -4ST. Second, a vertical difference of at least 4ST seems to be required to perceive the Rise-Fall. 73.1% of the participants perceived a rise-fall movement in the utterance with this vertical difference. In addition, it seems to be

[3] Strictly speaking, *Point 2* cannot be used in the last three utterances, because it does not show the peak. In 0ST, there is no change in the y-value, and in -2ST and -4ST, the f0 contour descends from *Point 1* to *Point 2*. For convenience, this term is used to show all eight points in question.

difficult to perceive the Rise-Fall when there is a vertical difference of only 2ST. The responses were divided equally. Third, utterances with vertical differences of 6 to 10ST seem to be fully qualified as the Rise-Fall. Only a small number of the participants did not perceive a rise-fall movement: 3+0 for the 6ST difference, 1+1 for the 8ST difference, and 3+2 for the 10ST difference.

4. Perception Test 4

The purpose of Perception Test 4 was to examine perceptual differences between the Rise-Fall and the High Fall in terms of three different prosodic factors (f0 contour, intensity and duration). Here the Rise-fall is abbreviated as the RF and the High Fall as the HF. For this purpose, two utterances ('^Ages a·go' and '\Ages a·go')[4] and four types of modification (*M1*, *M2*, *M3* and *M4*) were used. *M1* and *M2* were for changing the f0 contour. *M3* and *M4* were for changing intensity and duration, respectively. In this test, one, two, three or all types of modification were applied to the RF example in order to make it sound like the HF example, and the participants' task was to judge whether the modified utterances were perceived as the HF.

In *M1*, *Point 2* in the RF example was moved to the first syllable, or strictly speaking, to the peak of the HF, called *Point A*. This new utterance is referred to as *mu0001*, with *mu* standing for 'modified utterance' and *0001* indicating the type of modification applied in this modified utterance.[5] The y-value of *Point A* is the same between *mu0001* and the HF example. Strictly speaking, however, it is not the case with the x-value, though the diphthong /eɪ/ in both utterances is almost the same in duration: 196 ms in the RF example and 211 ms in the HF example. A slight difference in the x-value was made intentionally, because, as can be inferred from the results of Perception Test 2, the association of the peak and a segment may have great significance in perceptual equivalence. In the HF example, *Point A* was located at the boundary of the two elements of the diphthong, or at the 42% position from the diphthong-onset (88 ms / 211 ms x 100 = 41.7%). In contrast, it was decided to plot *Point A* in *mu0001* at the 37% position from the diphthong-onset (70 ms / 190 ms x 100 = 36.8%), because the boundary of the two elements of the diphthong was there. Following this operation, *Point A* in the *M1*-applied utterance was plotted at (72 ms, 194.6 Hz). A minor change was also added near the utterance-onset. A point was plotted at (27 ms, 171.7 Hz) in order to make the f0 contour of *mu0001* much closer to the HF example. This is displayed in Figure 5.

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[4] These two examples are in a sense ideal for comparison because duration is very similar in major places: 800 vs. 778 ms in 'Ages ago', 402 vs. 399 in 'Ages', and 196 vs. 211 in 'A'. The numbers on the left correspond to the RF example, and those on the right to the HF example.

[5] This means that *mu1234* is the final utterance to which all four types of modification are applied.

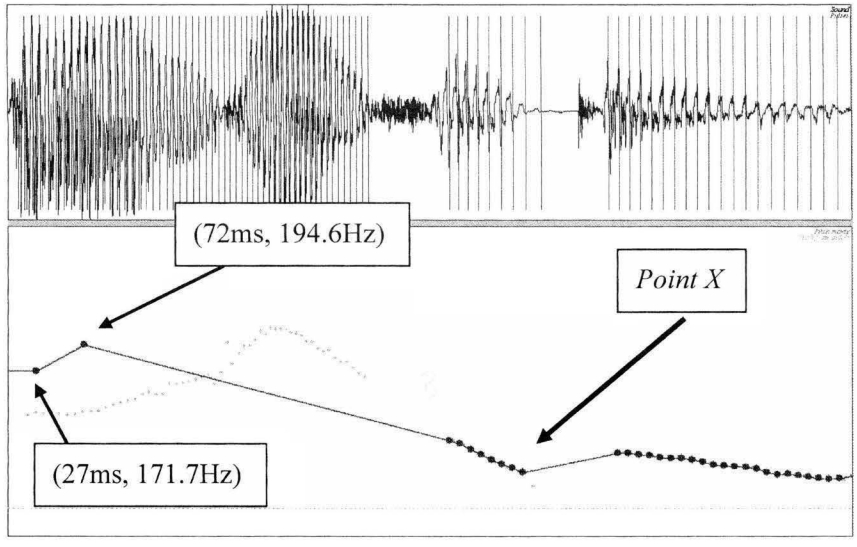

Figure 5 The f0 contour after *M1* is applied

In *M2*, another type of modification in the f0 contour was applied. One important criterion is that *M2* is always applied after *M1*. *M2* makes much smaller changes than *M1* and its main feature is to make the *M1*-applied utterance closer to the HF example in the f0 contour. To apply *M2* to the *M1*-applied utterance, the f0 contour between *Point A* and *Point X*[6] in Figure 6 was deleted and *Point B* was plotted at (334 ms, 82.0 Hz). The y-value was chosen in accordance with the HF example, and the x-value was chosen by keeping the y-value of the total /zə/ equal. Finally, *Point A*, *Point B* and *Point X* were connected by straight lines. No change in the f0 contour was made at /gəʊ/ because there was no significant difference in the f0 contour for this syllable between the two utterances. The application of *M2* to *mu0001* to produce *mu0012* is shown in Figure 6.

[6] *Point X* corresponds to the last pitch point for the first syllable /ə/ in 'ago'.

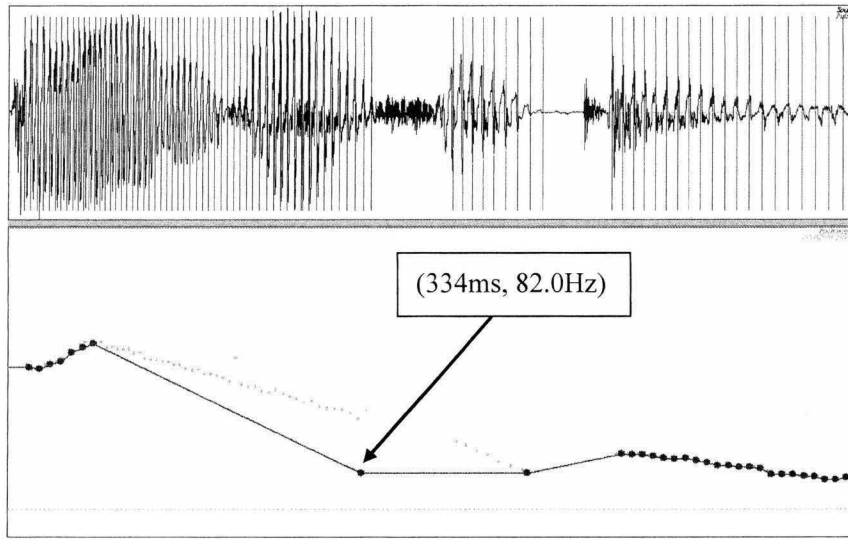

Figure 6 The f0 contour of *mu0012*

In *M3*, the intensity in the RF example was changed to make it as close as possible to that in the HF example. First of all, some places in the RF example were delimited as displayed in Figure 7.

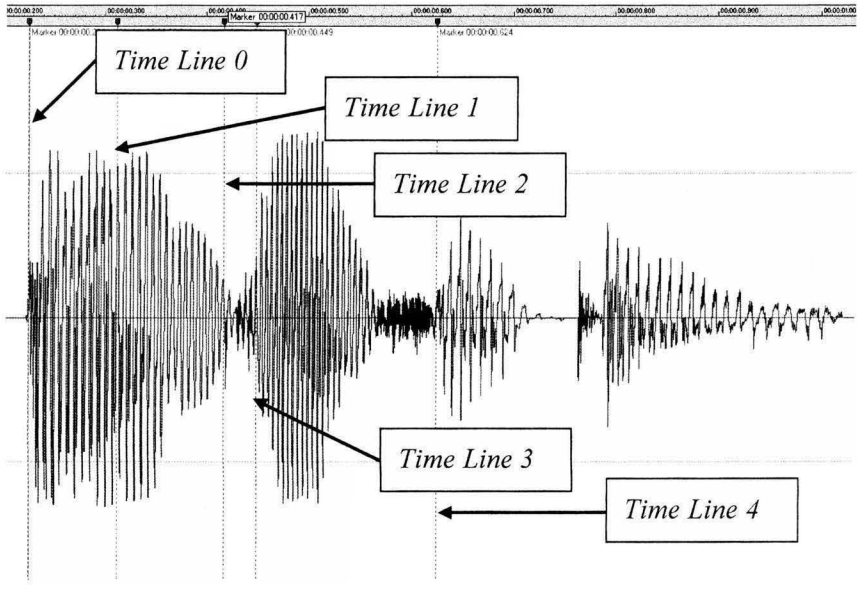

Figure 7 The waveform of '^Ages a·go'

The five vertical lines were drawn to delimit appropriate modification areas in intensity and/or duration. *Time line 0* corresponds to the utterance-onset. Comparing the waveform of the RF example with that of the HF example, it was decided to

change the intensity values in three places in this figure. The intensity was increased to 134% between *Time Line 0* (the utterance-onset) and *Time Line 1*, and to 150% between *Time Line 2* and *Time Line 3*. In contrast, the intensity was decreased to 64% between *Time Line 3* and *Time Line 4*. No other changes were made at 'ago'. The modified utterance after the application of *M3* is referred to as *mu0003*.

In *M4*, the duration in the RF example was changed to make it as close as possible to that in the HF example. The duration was increased by 20 ms between *Time Line 0* and *Time Line 2*, corresponding to /eɪ/, and by 17 ms between *Time Line 2* and *Time Line 3*, corresponding to /dʒ/. In contrast, the duration was decreased by 37 ms between *Time Line 3* and *Time Line 4*, corresponding to /ɪz/. No other changes were made at 'ago'. The modified utterance after the application of *M3* and *M4* is referred to as *mu0034*.

Ten types of utterances were made through the four types of modification: (1) *mu0001*, (2) *mu0003*, (3) *mu0004*, (4) *mu0012*, (5) *mu0013*, (6) *mu0014*, (7) *mu0123*, (8) *mu0124*, (9) *mu0134* and (10) *mu1234*. For comparison, the RF example (*mu0000*) and the HF example were added. In addition to these 12 test items, one more utterance of *mu1234* was added to check whether the difference in presenting order influences perception. It is true that some minor phonetic differences still existed between *mu1234* and the HF example, but under the available technology at the time this experiment was conducted, *mu1234* was the prosodically closest utterance to the HF example. One pre-test hypothesis was that *mu1234* may be more strictly judged if it occurred immediately or soon after the HF example. To increase the validity of this test, it was decided to double the number of utterances. The first 13 utterances (named 'Set C') are the same as the second 13 utterances (named 'Set D'), but the utterances in each set were arranged in a different order.

In this test, the participants' task was to judge whether two utterances sounded prosodically the same or different. The first utterance was one of the ten modified utterances, the RF example or the HF example, and the second utterance was the HF example. There was one-second pause between the two utterances, and a three-second pause after each test item.

The test results are summarized in Figure 8.

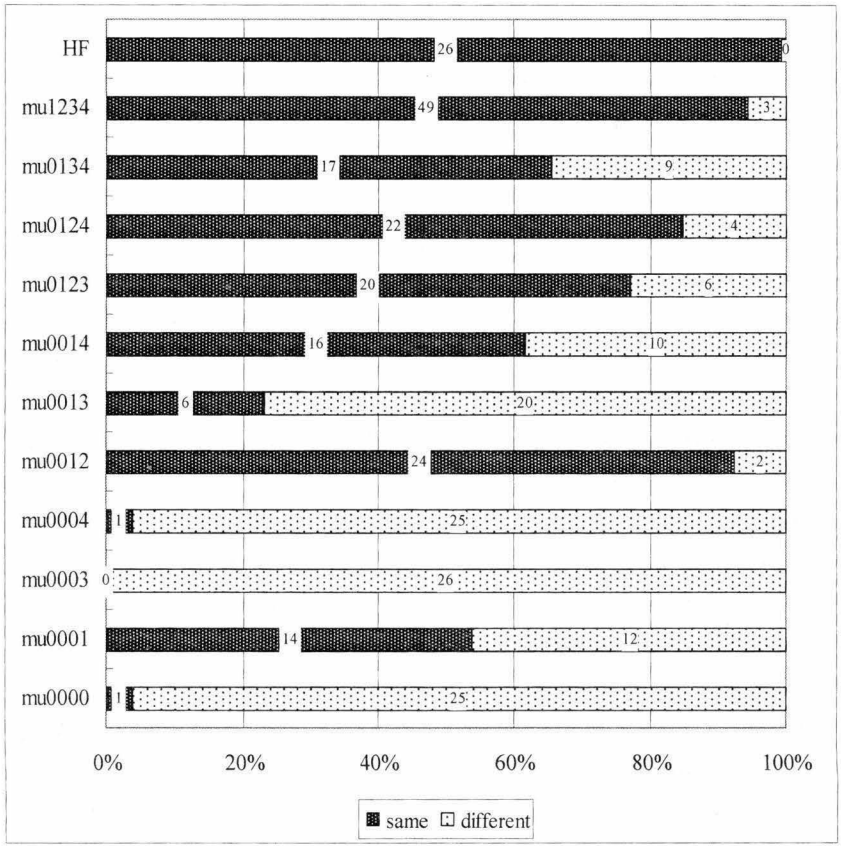

Figure 8 Results of Perception Test 4

The number in the bar indicates the number of responses. Note that the total number for *mu1234* is 52, because this test item was heard four times in the test. There were two main findings. First, the f0 contour is the most important prosodic factor followed by duration and intensity. 53.8% of the participants perceived the HF in *mu0001* and this rate was increased to 92.3% in *mu0012*. It seems that the minor change made in *M2* is highly effective in differentiating the RF from the HF. There was not much difference between *mu0003* (0%) and *mu0004* (3.8%), which clearly indicates that neither duration nor intensity is as important as the f0 contour. The HF was perceived by 23.1% of the participants in *mu0013*, but by 61.5% in *mu0014*, which shows another important influence of the f0 contour in perception. When *M2* was applied, the modified utterances became much closer to the HF example: 76.9% in *mu0123* and 84.6% in *mu0124*. Second, the types of modification used here are reasonably appropriate. The modified utterance to which all four modifications were applied was perceived almost equally as the HF example because in 94.2% of all the cases, the two utterances were perceived prosodically identical.

5. Discussion

In my analysis of the many examples of the Rise-Fall that were collected from six British English professional phoneticians, I learned that the peak (*Point 2*) tends to be located at the 30-60% position in relation to the duration of the syllable(s) for the essential f0 contour for the Rise-Fall (Yuzawa 2002). In T1 of Perception Test 1, the peak was located at 27.1%, 34.7%, 42.2%, 49.8% and 57.3% in relation of the total duration of 663 ms. These peaks are mostly within the range of 30-60%. This confirms the possible peak range for the Rise-Fall and suggests that the lower value may be extended slightly below 30%. The reason for the high correct rate may be related to the fact that the example was monosyllabic. It was known from the preliminary test results that it is easier for at least the participants in this experiment to perceive the Rise-Fall when there is no tail. In T2, the peak was located at 19.6%, 27.1%, 34.7%, 42.2%, 49.8%, 57.3% and 64.8% in relation of the total duration of 663 ms. Except for 19.6%, they are mostly within the range of 30-60%. Unlike the results of T1, when the peak is located below 27.1% or above 57.3%, the utterances were not heard as the Rise-Fall. This means that the locations of *Point 1* and *Point 3* are also important in the perception of the Rise-Fall, and that the range of 30-60% is applicable only when the locations of these two points are untouched.

I also learned from my past study that *Point 2* is not fixed at a certain segment in many cases, especially among different speakers. It may be assumed from this fact that some differences in the x-value of the peak are perceptually insignificant. That is why Perception Test 2 was conducted. Types II, III and IV were actually found in the examples of the Rise-Fall that I collected, but Types I and V are imaginary examples. As pointed out before, however, Types II, III and IV were not perceived identically. The reason may be that the participants responded to the difference phonetically, not phonologically. *Point 2* and *Point 3* were located differently between Types III and IV and all three points were located differently between Types II and IV. If their task was to choose utterances spoken with the Rise-Fall where the tonic syllable was located on 'blame', then they may have chosen Types II, III and IV in the same way. If this assumption is right, these three types could be interpreted as phonologically identical but phonetically different examples of the Rise-Fall. It appears that Type V was perceived very differently from the other four types, probably because the peak was located so far from the tonic syllable in the original utterance. In contrast, it seems that Type I was not that different. Only 15.4% perceived a difference between Types I and II. This is probably because there was not much difference in the locations of the three key points between them. In the case of Types I and III, a perceptual difference increased to nearly one-half. The main difference between the two types lies in the locations of *Point 2* and *Point 3*, and this difference may be big enough for some, but not for the others.

In the study of the Rise-Fall, it is also necessary to examine how high the peak should be, and this was the purpose of Perception Test 3. In my analysis of many Rise-Fall examples, the minimum vertical difference between *Point 1* and *Point 2* was 4.4ST. In this perception test, it was learned that a vertical difference of 4 or more is required, and this result supports my previous study. In the test, 16 test items were used, and all eight utterances were included equally in the first half and the second half. No mention was made as to the difference between these two sets in the test, but if we examine it closely, it seems that perception is influenced greatly by the preceding test item when a vertical difference is 4ST – the minimum value for the perception of the Rise-Fall. When such an utterance was tested, the Rise-Fall was perceived by 12 participants (92.3%) in one set, but by seven (53.8%) in the other. In the former, where the item number was 1 and there was no utterance to compare, almost all of the participants may have made a generous judgment. In the latter, where the item number was 6 and Items 4 and 5 included utterances with a difference of 8ST and 10ST, the remaining six participants seems to have made a stricter judgment. A similar case of perceptual influence by the preceding item was found in Perception Test 4. The modified utterance termed *0013* was perceived as prosodically the same as the High Fall example by six participants in Set D, but nobody related these two utterances in the same way in Set C. Since this modified utterance appeared at the beginning of the test, all the participants were not very confident about how to respond to it. Lack of comparison might have led them to make a stricter judgment. Interestingly, these two cases show completely opposing results as to how the first item is perceived. Unlike these two cases, when *mu1234* was tested, the result was entirely different. In Perception Test 4, this utterance appeared four times. The immediately preceding test item was *mu0001*, *mu0123*, the High Fall example and *mu0004*, and those who perceived the prosodic similarity between *mu1234* and the High Fall example were 13, 12, 12 and 12, respectively. The types of those four preceding utterances were very different, but the participants perceived them almost the same way. It seems that *mu1234* was made well to the extent that the presenting order did not give noticeable influence on perception.

In this type of perception test, perceptual error must be taken into account. This error was found in three perception tests. In Perception Test 2, two utterances were compared, and five pairs included identical utterances. When two utterances, both belonging to Type II, were compared, one participant perceived them differently. In Perception Test 3, when the utterance with a difference of 10ST, which was the original sentence, was tested, 19.2% of the responses were incorrect. When this utterance was tested in the preliminary test, all the participants responded correctly. Fatigue accumulated in the course of the tests may be one of the main reasons. In the same way, there were a few participants who perceived utterances with a difference of 0ST, -2ST and -4ST as the Rise-Fall (11.5%, 3.8% and 7.7%, respectively). In

Perception Test 4, one participant perceived the Rise-Fall example (*mu0000*) as the High Fall. This perceptual error may not be avoidable, as 't Hart (1990: 45) states that the correct response was 95.5% when identical utterances were given in pairs.

There has been a debate for decades as to a categorical or phonological status of the Rise-Fall against the Fall, but the preliminary test may have given us an important hint for such a status between the two tones as they were clearly differentiated by the participants. The results of Perception Test 4 indicate that this difference is heavily influenced by the three key prosodic factors.

Finally, it seems that learning experience helps to improve sensitivity to prosody. One participant, who studied English intonation for 17 years, responded to the tests very well, especially the preliminary test, Perception Test 1 and Perception Test 3. In the preliminary test, she was one of the four best participants who could differentiate the Rise-Fall from the High Fall at a rate of 95.8%. In Perception Test 1, she perceived the Rise-Fall in all the modified utterances in the first type, but ruled out two extreme utterances in the second type. In Perception Test 3, she clearly distinguished the Rise-Fall from the non-Rise-Fall. Her high scores may be related to her innate abilities, but her long learning experience of English intonation may have helped her to be more sensitive to English prosody.

6. Conclusion

In this paper, I examined perceptual aspects of the Rise-Fall using four perception tests. 13 females participated in the tests. Perception Tests 1 and 2 examined horizontal values of the peak, while Perception Test 3 examined its vertical values. Perception Test 4 examined how the f0 contour, duration and intensity influence perception.

It was confirmed that the peak range of 30-60% is applicable when two low points remain in the same place. It was learned that phonologically identical examples of the Rise-Fall cannot always be perceived as identical – probably phonetically identical, and that an utterance with a difference of 4ST may be the borderline for the perception of the Rise-Fall. It was also learned that the most important prosodic factor is f0 contour followed by duration and intensity.

This paper discussed the form of the Rise-Fall, but to understand this tone fully, it is obvious that its function needs to be examined in depth using real data.

Appendix

Preliminary Test

Directions

You will hear 24 utterances, all of which are written below. Each has a prominent syllable, which is underlined. This prominent syllable is spoken either with the Rise-Fall or with the High Fall. Please judge which tone is used in each of the 24 prominent syllables, and tick the box which you think shows the correct tone. There are three seconds after each utterance for you to decide your answer.

1. None.	☐Rise-Fall ☐High Fall
2. Go.	☐Rise-Fall ☐High Fall
3. Much.	☐Rise-Fall ☐High Fall
4. How?	☐Rise-Fall ☐High Fall
5. We thought you'd already gone.	☐Rise-Fall ☐High Fall
6. I've just won a hundred pounds.	☐Rise-Fall ☐High Fall
7. I love it.	☐Rise-Fall ☐High Fall
8. Yes but how soon?	☐Rise-Fall ☐High Fall
9. Getting fatter!	☐Rise-Fall ☐High Fall
10. I don't blame you.	☐Rise-Fall ☐High Fall
11. I love it.	☐Rise-Fall ☐High Fall
12. Getting fatter!	☐Rise-Fall ☐High Fall
13. Perfectly!	☐Rise-Fall ☐High Fall
14. Did he, now?	☐Rise-Fall ☐High Fall
15. I'm sure I can.	☐Rise-Fall ☐High Fall
16. On the contrary.	☐Rise-Fall ☐High Fall
17. I was able to do it in half the time.	☐Rise-Fall ☐High Fall
18. It's enough to make a saint angry.	☐Rise-Fall ☐High Fall
19. Naturally.	☐Rise-Fall ☐High Fall
20. Anyone would be.	☐Rise-Fall ☐High Fall
21. Oh ought I, indeed.	☐Rise-Fall ☐High Fall
22. No wonder the car wouldn't start.	☐Rise-Fall ☐High Fall
23. Why don't you do something about it?	☐Rise-Fall ☐High Fall
24. Then don't make so much fuss about it?	☐Rise-Fall ☐High Fall

Perception Test 1

Directions

You will hear 24 utterances. Please judge whether each utterance is spoken with the Rise-Fall or not. If you think that it is spoken with the Rise-Fall, please tick the 'yes' box, if not, please tick the 'no' box. There are three seconds after each item for you to decide your answer. The utterances you will hear are the same throughout this test: 'A'. Its sound corresponds to the vowel of 'car' in RP.

1. ☐ Yes ☐ No
2. ☐ Yes ☐ No
3. ☐ Yes ☐ No
4. ☐ Yes ☐ No
5. ☐ Yes ☐ No

6. ☐ Yes ☐ No
7. ☐ Yes ☐ No
8. ☐ Yes ☐ No
9. ☐ Yes ☐ No
10. ☐ Yes ☐ No

11. ☐ Yes ☐ No
12. ☐ Yes ☐ No
13. ☐ Yes ☐ No
14. ☐ Yes ☐ No
15. ☐ Yes ☐ No

16. ☐ Yes ☐ No
17. ☐ Yes ☐ No
18. ☐ Yes ☐ No
19. ☐ Yes ☐ No
20. ☐ Yes ☐ No

21. ☐ Yes ☐ No
22. ☐ Yes ☐ No
23. ☐ Yes ☐ No
24. ☐ Yes ☐ No

Perception Test 2

Directions

You will hear 15 pairs of utterances spoken with the Rise-Fall. Please judge whether the two utterances in each pair are identical or not, and tick the box showing your answer. There is one second between the two utterances, and three seconds are given after each pair for you to decide your answer. The utterances you will hear are the same throughout this test: 'I don't ^blame you'.

1. ☐same ☐different
2. ☐same ☐different
3. ☐same ☐different
4. ☐same ☐different
5. ☐same ☐different

6. ☐same ☐different
7. ☐same ☐different
8. ☐same ☐different
9. ☐same ☐different
10. ☐same ☐different

11. ☐same ☐different
12. ☐same ☐different
13. ☐same ☐different
14. ☐same ☐different
15. ☐same ☐different

Perception Test 3

Directions

You will hear the utterance 'I've just won a hundred pounds' 16 times. The tonic syllable or the nucleus is located in the underlined word 'pounds'. If you think that there is a rise-fall movement in this word, please tick the 'yes' box; if not, please tick the 'no' box. There are three seconds after each utterance for you to decide your answer.

1. ☐ Yes ☐ No
2. ☐ Yes ☐ No
3. ☐ Yes ☐ No
4. ☐ Yes ☐ No
5. ☐ Yes ☐ No

6. ☐ Yes ☐ No
7. ☐ Yes ☐ No
8. ☐ Yes ☐ No
9. ☐ Yes ☐ No
10. ☐ Yes ☐ No

11. ☐ Yes ☐ No
12. ☐ Yes ☐ No
13. ☐ Yes ☐ No
14. ☐ Yes ☐ No
15. ☐ Yes ☐ No

16. ☐ Yes ☐ No

Perception Test 4

Directions

You will hear an utterance ('Ages ago') twice in each of the following 26 items. In each item, please judge whether the first utterance sounds prosodically the same as or different from the second utterance. If you think these two utterances in each item sound the same, please tick the 'same' box; if not, please tick the 'different' box. There is one second between the two utterances in each item, and three seconds are given after you hear the second utterance for you to decide your answer.

1. ☐ same ☐ different
2. ☐ same ☐ different
3. ☐ same ☐ different
4. ☐ same ☐ different
5. ☐ same ☐ different

6. ☐ same ☐ different
7. ☐ same ☐ different
8. ☐ same ☐ different
9. ☐ same ☐ different
10. ☐ same ☐ different

11. ☐ same ☐ different
12. ☐ same ☐ different
13. ☐ same ☐ different
14. ☐ same ☐ different
15. ☐ same ☐ different

16. ☐ same ☐ different
17. ☐ same ☐ different
18. ☐ same ☐ different
19. ☐ same ☐ different
20. ☐ same ☐ different

21. ☐ same ☐ different
22. ☐ same ☐ different
23. ☐ same ☐ different
24. ☐ same ☐ different
25. ☐ same ☐ different

26. ☐ same ☐ different

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Abstract

Perceptual aspects of the Rise-Fall tone in English were examined in this paper, especially the focus being on its peak. It was confirmed that the peak of the Rise-Fall ranges from 30% to 60% when the two other key points remain where they are. It was also learned that a vertical difference of 4ST is minimally required for an utterance to be perceived as spoken with the Rise-Fall. By comparing this tone with the High Fall, it was found that the f0 contour is the most important prosodic factor, followed by duration and intensity.

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